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could then get quite close to them. In the sea, the ponds and the glacial streams, animal life was not abundant. Some polar cod and inferior fish were usually the results of net-fishing. In one of the lakes, however, salmon was plentiful.

The expedition spent two years in Greenland, and the weather in one year differed much from that of the other. The winter of 1906-7 was cold and calm, the winter of 1907-8 milder and more windy. The ice in the first winter was 6 feet thick and broke up very late; in the second, it was only 4 feet thick. In the middle of February the sun returned, and May and June were a period of fogs and faint sea breezes. Otherwise, the wind was constantly from the northwest, due to the high air pressure over the inland ice. The climate was very healthful, and there were no diseases among the men. The only time the physician, Dr. Lindhard, acted in his professional capacity was once when poisoning resulted from eating a bear's liver.

No living Eskimo were found, but everywhere along the coast up to Denmark Fiord their tent stones, meat caches, and in some places even winter dwellings, were discovered. From their kayaks and oomiaks they had hunted the sea animals now found there, and also whales and reindeer, which the explorers did not find. The ethnologist, Thostrup, made a very interesting collection of their various tools, etc.

Lieut. Trolle said, with regard to the motor car in polar work, that he believed a stronger car than they took north would do good service where the surface is hard as on the inland ice. On the snow the motor car is too heavy and sinks in too deeply.

DR. STEIN'S TWO YEARS OF EXPLORATION.

Dr. M. A. Stein, Inspector-General of Education and Archæological Surveyor in the Northwest Frontier Province of India and Baluchistan, has completed his second series of explorations in Central Asia, which he undertook in 1906. The work has added largely to the brilliant archæological and geographical results which he attained in Eastern Turkestan in 1900-1. It will be remembered that, through this earlier work, Dr. Stein revealed the full extent to which Indian influence had established itself in Eastern Turkestan from a very early period, not merely through the spread of the Buddhist religion, but also in respect of languages, material culture and art. His investigations demonstrated, further, that the influence of the classical West had penetrated even that distant part of Central Asia during the early centuries of the Christian era.

Dr. Stein's work was so rich in results that in 1905 the British Museum voted a grant of $10,000 towards the expenses of the expedition now concluded. His enterprise also had the substantial aid of the Indian Government, and the Survey of India gave him again the services of the native surveyor Rai Ram Singh, who, on the first expedition, helped Dr. Stein to add much to our knowledge of the magnificent mountain region in the western section of the Kwen-Lun Range. He took with him also survey instruments which enhanced the value of his geographical studies.

The progress of Dr. Stein has, from time to time, been reported in the London *Times* and the *Geographical Journal.* The following outline of the chief features of the work he has completed is condensed from the *Scottish Geographical Magazine,* which, from 1906 tò January of this year, has printed a series of articles on the expedition.

Dr. Stein reached Kashgar, the capital of Eastern or Chinese Turkestan, in June, 1906, and left that city with his caravan at the end of the month. At Khotan, to the southeast, in August, his archæological labours began and interesting finds were made there. In his letters he emphasized the fact that cultivation was spreading in the Khotan region, on the southern edge of the great desert, to large areas that were covered by sand on his previous visit. They were now being reclaimed and water in the Khotan Oasis was abundant. He believes that irrigation on a large scale may successfully be carried out there.

Then Dr. Stein travelled 600 miles eastward to the northwest part of the Chinese province of Kansu. His route through the intervening desert was the same as Marco Polo followed, and Dr. Stein found that this famous explorer's description of the route was thoroughly accurate in all its topographical details. More than one-third of the route skirted the shores of a vast salt-covered lake, indicating the extent of the Lop-nor marshes at a period that was probably not very remote. The detailed survey by Rai Ram Singh showed clearly that the well-marked depressions between the slopes of the Kuruk-tagh to the north, and the Altyn-tagh to the south of Lop-nor, along which the expedition marched, had once served for the passage of the waters of the Su-lei-ho and Tun-hoang rivers far to the northeast, down to Lop-nor.

About the middle of June, 1907, Dr. Stein began his geographical work in the western and central Nan-shan Mts., Kansu Province.

His first move led towards the great snowy range south, which forms the watershed between the Su-lei-ho and Tun-hoang rivers. On the lowest of a succession of barren plateaus built up by parallel outer ranges he discovered a large ruined site near the village of Chiao-tzu. These ruins of an important town, abandoned about the twelfth or thirteenth centuries A. D., afford interesting proofs of the processes of desiccation and wind erosion which have greatly altered the physical and economic conditions of the outer hill region.

An instrumental survey was made of the great chain of glacier-crowned peaks, which overlook the barren outer ranges and detritus plateaus of the Nan-shan, west of the Su-lei-ho and Dr. Stein and his party then made their way over hitherto unexplored ground to the foot of the mountains near the famous Chia-yü-Kwan gate of the "Great Wall." The imposing line of this wall, which bends around the westernmost part of the Su-chou Oasis and extends to the very foot of the Nan-shan, has always been represented as the end of the ancient "Great Wall" guarding the northern border of Kansu. But careful examination disclosed to Dr. Stein the junction of two lines of frontier defense near Chia-yü-Kwan. One line is a crumbling wall of stamped clay which runs along the whole northern border of the Su-chou and Kan-chou districts and dates from the second century B. C. Its purpose was evidently to safeguard the narrow belt of oases along the north foot of the Nan-shan which was needed as a passage into Eastern Turkestan when Chinese political and commercial expansion towards the "Western regions" began under the first Han dynasty. The second line meets this ancient wall at right angles and probably dates no further back than the 15th-16th century A. D. It was built for the very different purpose of closing the great route towards Central Asia and the west at a time when China had once more resumed her traditional attitude of seclusion.

Su-chou, the first town within the wall, served as base for Dr. Stein's expedition into the Central Nan-shan. During August, 1907, the party crossed and surveyed in detail the three northernmost ranges of the Central Nan-shan, all rising to peaks of 18,000 and 19,000 feet between the longitudes of Su-chou and Kan-chou. All the rivers descending to these oases, as well as the Su-lei-ho, were explored to their glacier-fed sources. The magnificent ice-crowned range which divides the headwaters of the Su-lei-ho from the Koko-nor and Khara-nor drainage was also surveyed along the whole length of its north face. Its height exceeds that of the northern ranges. It was curious to meet in the wide mountain-girt basin, 13,000 feet above the sea, where the Su-lei-ho gathers its main sources, the same combination of marshes and drift sand areas that marks the desert depression where the river dies away between Tun-huang and Lop-nor. From this region Dr. Stein made his way over difficult bog-covered uplands into the unexplored Alpine tract where the Ta-tung River, the most northern large tributary of the Hwang-ho, rises. After this short visit to the edge of the Pacific drainage he regained the broad valley of the upper Huei-ho or Kan-chou River.

Excellent work was done in this almost unknown mountain area. The plane table survey on a scale of 4 miles to an inch between An-shi and Kan-chou was about 24,000 square miles. The position of many stations was fixed astronomically by theodolite observations, and reliable height measurements were secured for all important peaks and passes by means of mercurial barometer and clinometer readings. A large series of photographic panoramas was taken by Dr. Stein, illustrating the characteristic features of the great ranges as they presented themselves from commanding positions.

From Kan-chou, Dr. Stein began early in September, 1907, the long journey westward back to the Tarim Basin. The journey was made by the caravan route, through Hami and Turfan, in the mountain region of northern Chinese Turkestan, and much survey work was done along the way.

In the winter of 1907-8 Dr. Stein began his explorations at Kara-shahr, in the extreme northeast of the Tarim Basin. He traced the sites of ancient towns at several points of the great plain, now a waste, covered with scrub and jungle, which encircles the Bagrash Lake on the north. Subsoil water, impregnated with salts and the effects of a climate less dry than in other parts of this Turkestan depression, had completely destroyed the structures that once stood within the still extant clay ramparts. A better field for excavations was offered by the numerous ruins of Buddhist shrines which occupy low rock terraces near the Kara-shahr River, where sculptures, paintings and other objects were unearthed. This wide plain of scrub and sand might to-day be easily brought under irrigation by canals from the Kara-shahr River. The supply of water in the river far exceeds the needs of the narrow strip of land actually cultivated by the Tungans and semi-nomad Mongols.

Dr. Stein then struck across the broad belt of waterless desert to the northwest and north of the oases of Domoko, and his excavations resulted in finds of well-preserved manuscripts in Indian scripts, Buddhist paintings on wood, etc. March and early April were spent in these archæological labours along the desert belt adjoining the oases from Domoko to Khotan. He found the remains of a large

Buddhist temple, decorated with elaborate frescoes, now completely buried by high dunes in the desert strip between Yurung-kash and the Karakash rivers. The temple proved to belong to the early centuries of our era.

Meanwhile, Rai Ram Singh completed a detailed survey of unmapped ground to the northwest and north of the Khotan oases, and then the party set out through the desert along the Khotan River bed. Six marches below the oases, Dr. Stein discovered the ruins of a fortified watch station once guarding the river route. The fort had been destroyed by fire, but on the steep rock slope, below big masses of refuse that the occupants had thrown out, Dr. Stein recovered a great collection of documents on wood and paper in a variety of scripts, mainly Indian, Chinese and Tibetan, and none apparently later than the eighth and ninth centuries A. D.

In May last the expedition reached Aksu, in northwestern Chinese Turkestan, and while the surveyor made a continuous survey along the outer Tian Shan Range westward as far as the passes above Kashgar, Dr. Stein travelled up the Uch-Turfan Valley and thence across a barren but remarkably picturesque mountain range to the oases of Kalpin. In the Kalpin region he secured sufficient evidence to conclude that this tract was occupied down to the eighth century A. D. by large settlements to which canals still traceable in part carried water from the Kashgar River. Dr. Stein was back in Khotan by the middle of June.

Rai Ram Singh, after carrying his plane-table survey along the foot of the Tian Shan from Aksu to Kashgar, succeeded in mapping the large portions of unknown country on the southern slopes of the Kwen-lun Range west of Khotan. He then rejoined Dr. Stein at Khotan, and on August 1 last the explorer despatched 50 camel loads of antiques, including 30 cases of ancient manuscripts and other records, to the foot of the Karakorum, where it was to await him while he and his surveyor started on their long-planned expedition to the sources of the Khotan River.

This journey was of much geographical importance. Dr. Stein established survey stations close under the crest line of the main Kwen-lun Range, about 20,000 feet above the sea, and mapped with theodolite, plane-table and photographic panoramas the greater part of the wild mountain region containing the Khotan headwaters. On the south for over 60 miles they proved to be flanked by a magnificent range of snowy peaks, rising to over 23,000 feet and clad with glaciers more extensive than any Dr. Stein had so far seen in the Kwen-lun. By crossing side spurs over passes 17,000 to 18,000 feet high, they succeeded in tracing the great river to its ice-bound head in a basin 16,000 feet above the sea.

Dr. Stein then followed the great snowy range which he had found flanking the Khotan headwaters on the southeast and south to its end in the uppermost valley of the Keriya River, and then began the exploration of the hitherto unsurveyed ground westward.

This area figures on most maps as a high plain called the Aksai-chin Desert. It proved to be of a different character. High snow-covered spurs, with broad valleys between them, descend here from the great range flanking the Khotan. The streams brought down by these valleys rarely reach the large lakes and marshes at the foot of these spurs, but in most cases lose themselves in vast alluvial fans of detritus above the depressions which connect the lakes and marshes. The direction of these depressions, all of which bear signs of having been ancient lake beds running from east to west, greatly facilitated progress, but vegetation almost completely disappeared, and soon fresh water ceased to be obtainable except by digging wells in dry water courses, and the result was that nearly one-third of the pack animals were lost.

On the last day of his long labours, Dr. Stein found himself completely disabled by severely frostbitten feet. He was carried on a litter to Leh, on the edge of civilization, where an operation was performed, and it is hoped that the unfortunate accident will lead to no permanent inconvenience. His heavy caravan of antiques safely arrived at the foot of the Karakorum. Rai Ram Singh had succeeded in mapping no less than 17,000 square miles of mountainous ground. It is expected that, early this year, Dr. Stein will be seen again in Europe.

GEOGRAPHICAL RECORD.

AMERICA.

Driftwood Near the Mackenzie Delta.—Mr. Alfred H. Harrison, in his recent book "In Search of a Polar Continent," says that the shore of the Arctic Ocean, from Herschel Island to Cape Brown, is piled many feet high with drift wood which has floated down the Mackenzie River. Whole trees, bared of their bark and branches, but otherwise intact as when they stood in their native forest, lie spread, root and bole, along this shore. Some of them measure 100 ft. in length, and trunks which are long enough for spars or masts are plentifully strewn around. There are likewise many knotty pieces that the whale-fishers convert into useful furniture, which, when polished, are even more glossy and handsome than oak. When the ships get out of fuel, gangs of men are sent to the coast to cut cords of wood for their whaling cruises.